

CHAPTER II

(Transmittal Letter to the United States Elected Office (EO/US) [13-18]—page 1 of 9)

NOTE: To avoid abandonment of the application, the applicant shall furnish to the USPTO, not later than 20 months from the priority date: (1) a copy of the international application, unless it has been previously communicated by the International Bureau or unless it was originally filed in the USPTO; and (2) the basic national fee (see 37 C.F.R. § 1.492(a)). The 30-month time limit may not be extended. 37 C.F.R. § 1.495.

WARNING: Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing—See 37 C.F.R. § 1.8.

NOTE: Documents and fees must be clearly identified as a submission to enter the national state under 35 U.S.C. § 371 otherwise the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1.494(f).

- I. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. § 371:
- a. ☒ This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).
 - b. ☒ The U.S. National Fee (35 U.S.C. § 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

RECEIVED 11/30/01

2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
<input type="checkbox"/> *	TOTAL CLAIMS				
	27	-20=	7	× \$18.00=	\$ 126.00
	INDEPENDENT CLAIMS				
	2	-3=	-0-	× \$80.00=	
	MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+ \$270.00
BASIC FEE**	<input type="checkbox"/> U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an international preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: <ul style="list-style-type: none"> <input type="checkbox"/> and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 C.F.R. § 1.492(a)(4)) \$100.00 <input type="checkbox"/> and the above requirements are not met (37 C.F.R. § 1.492(a)(1)) \$690.00 <input checked="" type="checkbox"/> U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: <ul style="list-style-type: none"> <input type="checkbox"/> has been paid (37 C.F.R. § 1.492(a)(2)) \$710.00 <input type="checkbox"/> has not been paid (37 C.F.R. § 1.492(a)(3)) \$1000.00 <input checked="" type="checkbox"/> where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 C.F.R. § 1.492(a)(5)) \$860.00 				
	Total of above Calculations				= \$988.00
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Assertion must be made. (note 37 C.F.R. § 1.27)				-
	Subtotal				\$988.00
	Total National Fee				\$ 988.00
	Fee for recording the enclosed assignment document \$40.00 (37 C.F.R. § 1.21(h)). (See Item 13 below). See attached "ASSIGNMENT COVER SHEET".				
TOTAL	Total Fees enclosed				\$ 988.00

☐ to Credit card as shown on the attached credit card information authorization form PTO-2038.

(Transmittal Letter to the United States Elected Office (EO/US) [13-18]—page 4 of 9)

(3) Assertion by payment of the small entity basic filing or basic national fee. The payment, by any party, of the exact amount of one of the small entity basic filing fees set forth in §§ 1.16(a), (f), (g), (h), or (k), or one of the small entity basic national fees set forth in §§ 1.492(a)(1), (a)(2), (a)(3), (a)(4), or (a)(5), will be treated as a written assertion of entitlement to small entity status even if the type of basic filing or basic national fee is inadvertently selected in error.

(i) If the Office accords small entity status based on payment of a small entity basic filing or basic national fee under paragraph (c)(3) of this section that is not applicable to that application, any balance of the small entity fee that is applicable to that application will be due along with the appropriate surcharge set forth in §§ 1.16(e), or §§ 1.16(f).

(ii) The payment of any small entity fee other than those set forth in paragraph (c)(3) of this section (whether in the exact fee amount or not) will not be treated as a written assertion of entitlement to small entity status and will not be sufficient to establish small entity status in an application or a patent."

3. ☒ A copy of the International application as filed (35 U.S.C. § 371(c)(2)):

NOTE: Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.

- a. ☐ is transmitted herewith.
- b. ☐ is not required, as the application was filed with the United States Receiving Office.
- c. ☒ has been transmitted
 - i. ☒ by the International Bureau.

Date of mailing of the application (from form PCT/1B/308):

- ii. ☐ by applicant on _____ (Date)

4. ☒ A translation of the International application into the English language (35 U.S.C. § 371(c)(2)):

- a. ☒ is transmitted herewith.
- b. ☐ is not required as the application was filed in English.
- c. ☐ was previously transmitted by applicant on _____ (Date)
- d. ☐ will follow.

5. ☐ Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. § 371(c)(3)):

NOTE: The Notice of January 7, 1993 points out that 37 C.F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 36.

- a. ☐ are transmitted herewith.
- b. ☐ have been transmitted
- i. ☐ by the International Bureau.
Date of mailing of the amendment (from form PCT/1B/308):

- ii. ☐ by applicant on _____ (Date)
- c. ☐ have not been transmitted as
- i. ☐ applicant chose not to make amendments under PCT Article 19.
Date of mailing of Search Report (from form PCT/ISA/210.):

- ii. ☐ the time limit for the submission of amendments has not yet expired. The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. ☐ A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. § 371(c)(3)):

- a. ☐ is transmitted herewith.
- b. ☐ is not required as the amendments were made in the English language.
- c. ☐ has not been transmitted for reasons indicated at point 5(c) above.

7. ☒ A copy of the international examination report (PCT/IPEA/409)

- ☒ is transmitted herewith.
- ☐ is not required as the application was filed with the United States Receiving Office.

8. ☐ Annex(es) to the international preliminary examination report

- a. ☐ is/are transmitted herewith.
- b. ☐ is/are not required as the application was filed with the United States Receiving Office.

9. ☐ A translation of the annexes to the international preliminary examination report

- a. ☐ is transmitted herewith.
- b. ☐ is not required as the annexes are in the English language.

10. ☒ An oath or declaration of the inventor (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115
- a. ☐ was previously submitted by applicant on _____. (Date)
 - b. ☐ is submitted herewith, and such oath or declaration
 - i. ☐ is attached to the application.
 - ii. ☐ identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. § 1.70.
 - c. ☒ will follow.

II. Other document(s) or information included:

11. ☒ An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):
- a. ☒ is transmitted herewith.
 - b. ☐ has been transmitted by the International Bureau.
Date of mailing (from form PCT/IB/308): _____
 - c. ☐ is not required, as the application was searched by the United States International Searching Authority.
 - d. ☐ will be transmitted promptly upon request.
 - e. ☐ has been submitted by applicant on _____. (Date)
12. ☐ An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:
- a. ☐ is transmitted herewith.

Also transmitted herewith is/are:

- ☐ Form PTO-1449 (PTO/SB/08A and 08B).
 - ☐ Copies of citations listed.
 - b. ☐ will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).
 - c. ☐ was previously submitted by applicant on _____. (Date)
13. ☐ An assignment document is transmitted herewith for recording.
- A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

14. ☐ Additional documents:
- a. ☐ Copy of request (PCT/RO/101)
 - b. ☐ International Publication No. _____
 - i. ☐ Specification, claims and drawing
 - ii. ☐ Front page only
 - c. ☒ Preliminary amendment (37 C.F.R. § 1.121)
 - d. ☐ Other

15. ☒ The above checked items are being transmitted
- a. ☒ before 30 months from any claimed priority date.
 - b. ☐ after 30 months.
16. ☐ Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on _____, namely:

AUTHORIZATION TO CHARGE ADDITIONAL FEES

WARNING: Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

- ☒ Please charge, in the manner authorized above, the following additional fees that may be required by this paper and during the entire pendency of this application:
- ☒ 37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.

- ☒ 37 C.F.R. § 1.492(b), (c) and (d) (presentation of extra claims)

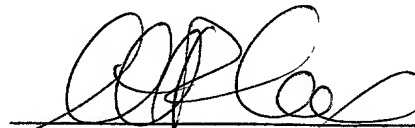
NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

- ☐ 37 C.F.R. § 1.17 (application processing fees)
- ☐ 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a).
- ☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

- ☐ 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).



SIGNATURE OF PRACTITIONER

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(type or print name of practitioner)

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Customer No.:

JC13 Rec'd PCT/PTO 30 NOV 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of :
Udo Skerdi :
 : Art Unit:
Serial No. :
 : Examiner:
Filing Date :
 :
Attorney Docket No. P-1105 :
 :
For: EXOTHERMAL FEEDER MASS :

Box PCT
Assistant Commissioner for Patents
Washington, D.C. 20231
Attention: EO/US

PRELIMINARY AMENDMENT

The applicant filed a German patent application, No. 199 25 167.3, on June 1, 1999 (the German application"). On May 20, 2000 a PCT application, WO 00/73236 (PCT/EP 00/04597) (the "PCT application") was filed with the European Patent Office designating the United States, which PCT application claimed priority from that German application. The applicant now wishes to enter the U.S. national phase by filing the attached patent application (the "Application"). The Application which is attached to this Preliminary Amendment as Exhibit A is a translation of that PCT application as originally filed in German. This translation of the PCT application forms the basis for the Application to be reviewed by the United States Patent and Trademark Office.

In the Specification

The applicant has amended the specification of the Application to place it in better condition for review by the United States Patent and Trademark Office without adding any new subject matter. Attached to this Preliminary Amendment as Exhibit A is a copy of the Application with the amendments to the specification of the Application noted in handwriting on the text of the Application. Attached as Exhibit B is a copy of the Application with the handwritten amendments incorporated therein.

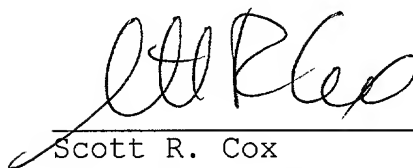
In the Claims

The Applicant cancels all claims as originally included with the Application, Claims 1 through 10 (see Exhibit A) and replaces them with new Claims 11 through 37. These claims are the only claims included in the amended Application which is attached as Exhibit B. These claims are in a better form for review by the United States Patent and Trademark Office than the claims of the PCT application, Exhibit A. No new subject matter is introduced into the Application by these new claims.

CONCLUSION

The applicant believes that the Application as shown in Exhibit B is in condition for review by the United States Patent and Trademark Office and requests that a review of the Application occur.

Respectfully submitted,



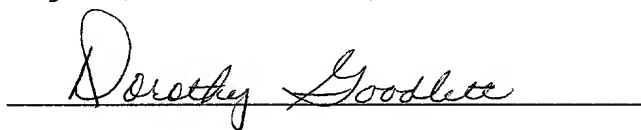
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Attachments

CERTIFICATE OF SERVICE

I hereby certify that this correspondence is being deposited with the United States Postal Service in an envelope as Express Mail Post Office to Addressee," mailing Label Number **EK317082378US**, addressed to Box PCT, Assistant Commissioner for Patents, Washington, D.C. 20231, Attn: EO/US.

Dated: Nov. 30, 2001



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TitleExothermal Feeder MassSpecificationBackground

The invention relates to an exothermal feeder mass containing aluminum and magnesium, at least one oxidizing agent, a temperature-resistant SiO_2 -containing filler, and an alkali silicate as the binder.

Prior Art

In exothermal feeder masses aluminum is used to cause an exothermal reaction with the oxidizing agent. Known feeder masses also contain a reactive fluorine compound which reacts with a passivating oxide skin on the aluminum powder so that the latter can react with the oxidizing agents.

One such feeder mass is described in DE-C-25 32 745. It contains among other materials, aluminum powder, an unspecified aluminum oxide and an organic material (phenol resin, urea resin or furan resin, starch) or an inorganic binder (silica sol, colloidal aluminum oxide) and an oxidizing agent for the fine-particle metal. The use of alkali silicates as binders is not mentioned. The fluorine compounds, called "fluoride catalysts", such as cryolite, fluorspar or sodium silicofluoride are important. The proportion of the fluorine compound can be 0.1 to 20% by weight. According to the examples the proportion of the fluoride compound is between 1.0 and 2.0%.

The presence of the fluorine compound in the exothermal feeder mass reduces the starting reaction temperature of the aluminum. This function results, for example, from the fact that for the likewise described heat-insulating feeder mass without aluminum the proportion of the fluoride compound can decrease to 0%.

DE-A-29 23 393 mentions among other material, exothermal feeder masses with aluminum powder, cryolite, iron oxide, sand and aluminum oxide fibers. The latter should be preserved as fibers.

DE-C-28 31 505 describes an exothermal feeder mass with an Al_2O_3 additive which can be construed as an inert filler. Alkali silicates are not used, but the addition of a fluoride-containing flux (cryolite) is always necessary. Magnesium is not used.

DD-60 121 describes an exothermal feeder mass based on aluminum with the addition of water glass and a fluoride-containing flux. Aluminum oxide is not mentioned.

Since for environmental and process-engineering reasons there is a need for a fluoride-free exothermal feeder mass, it has already been suggested that an exothermal feeder mass without active fluorine portions be made available. One such feeder mass contains not only aluminum, but also magnesium or an aluminum-magnesium alloy. The passivity caused by the oxide skin on the aluminum is overcome by the temperature which occurs when the magnesium burns so that the aluminum also reacts with the oxidizing agent, by which a higher temperature is reached overall. In doing so, unwanted reactions occur in the feeder mass.

It was found that for fluoride-free exothermal feeder masses which contain aluminum and magnesium and also fillers with high SiO_2 content and alkali compounds (for example, from water glass) as the binder and alkali nitrates as the oxidizing agent, a so-called "hollow fire" is

formed which probably originates from vitrification of the SiO_2 -containing fillers with the alkali compounds.

This hollow fire is evidenced by the formation of large cavities in the feeder wall which are connected by channels to the molten iron in the feeder. Iron losses occur due to penetration of the molten iron into these cavities. Moreover, this iron can only be separated from the reacted feeder mass with difficulty, so that it is almost impossible to re-process the iron.

The object of this invention is to reduce the so-called "hollow fire".

It has been found that surprisingly a hollow fire does not occur when a reactive or extremely finely ground aluminum oxide is added to the feeder mass.

The subject matter of the invention is thus an exothermal feeder mass which contains about 2.5 to 20% by weight of a reactive aluminum oxide with a specific surface area of at least about $0.5 \text{ m}^2/\text{g}$ and an average particle diameter (d_{50}) from about 0.5 to 15 microns and which is essentially free of fluoride-containing fluxes.

The reactive aluminum oxide generally contains up to about 5% OH groups. When the proportion of OH groups is relatively low, reactivity is also achieved by the very small size of the aluminum oxide particles.

"Essentially free" is defined as having a fluoride content below 1.0, preferably below 0.5, most preferably below 0.1% by weight.

The exothermal feeder mass, as claimed in the invention after reaction, contains only small cavities which are not connected to one another by channels so that no iron from the feeder core can intrude.

It is believed that the reactive aluminum oxide reacts with the existing alkali compounds

so that it can no longer react with the SiO_2 -containing filler resulting in vitrification and cavity formation. When hollow fire no longer occurs, during and after the end of the reaction of the feeder mass, the strength of the mass also increases.

The reactive aluminum oxide in the feeder mass of the invention preferably has a specific surface area of about 1 to 10 m^2/g . Generally the composition of the feeder mass of the invention is as follows:

Aluminum: 20 - 35% by weight, preferably 20 - 23% by weight

Magnesium: 1.5 - 10% by weight, preferably 2 - 7% by weight

Oxidizing agent: 8 - 20% by weight, preferably 10 - 15% by weight

Reactive aluminum oxide: 4 - 18% by weight, preferably 8 - 13% by weight

Alkali silicate: 8 - 22% by weight, preferably 10 - 13% by weight or 17 - 23% by weight

SiO_2 -containing filler: 58.5 - 17% by weight, preferably 43 - 29% by weight

The preferred amounts of the alkali silicate depend on the filler that is chosen. For fillers with a smaller bulk density (for example, hollow microspheres) the preferred amount of the alkali silicate is higher.

The oxidizing agent, as in conventional feeder masses, is iron oxide and/or an alkali nitrate, such as sodium or potassium nitrate, or the reduction product of the latter (alkali nitrite or alkali oxide) reacting with the reactive aluminum oxide.

Preferably the SiO_2 -containing filler has a SiO_2 content of at least 50% by weight,

preferably more than 60% by weight.

The temperature-resistant SiO_2 -containing fillers can be quartz, sand and/or aluminum silicates, in the latter case preferably hollow microspheres, ground chamotte and/or mineral fibers being used.

The reactive aluminum oxide preferably has the following properties:

Al_2O_3 content	> 90%
Content of OH-groups:	up to 5% (depending on the particle diameter)
Specific surface area (BET)	about 1 to 10 m^2/g
Average particle diameter (d_{50}):	0.5 to 15 microns

The subject matter of the invention is also a process for reducing the hollow fire in essentially fluoride-free feeder masses. The process is characterized by a feeder mass as defined above being used.

It was furthermore found that when using the feeder mass of the invention, a change of the molten iron contained in the feeder mass, which change extends into the casting, surprisingly occurs. The basic metallic structure is changed such that degeneration of the solidified casting mass due to the formation of lamellar graphite is prevented and the desired spheroidal graphite is formed. This can possibly be attributed to the presence of magnesium in the feeder mass as a spherogenic additive, although it does not come directly into contact with the molten iron and therefore no interaction between the two could be expected. A reaction of the magnesium contained in the feeder mass with the molten iron in the vapor phase is not likely, as magnesium has an extremely low vapor pressure and the feeder mass contains air inclusions between the

grains of fine-grain mineral, so that the vaporous magnesium would immediately react with atmospheric oxygen. The effect which can be achieved by the invention is probably due to the feeder mass containing impurities (for example, sulfur) which can diffuse without the magnesium in the feeder mass into the molten iron and in this way can react with the very small amounts of the spherogenic additive (for example, magnesium) in the molten iron, so that when the iron solidifies, lamellar graphite rather than spheroidal graphite forms. It is assumed that the magnesium in the feeder mass reacts with the impurities contained therein so that they can no longer diffuse into the molten iron. The magnesium therefore apparently has a "scavenger" function.

In addition to the magnesium, other spherogenic additives, such as cerium, can be used. Alkali metals or alkaline earth metals other than magnesium, for example, calcium, are not as well suited since they easily oxidize in air.

The subject matter of the invention is thus also a process for preventing graphite degeneration in the feeder neck area and in the area which extends into the casting. This process is characterized by a feeder mass as defined above being used.

The invention is explained by the following examples.

Example 1

Formulation:

Aluminum (0.063 - 0.5 mm grain size)	20% by weight
Sodium nitrate as oxidizing agent:	15% by weight
Magnesium (0.1 - 0.5 mm grain size)	4.5% by weight
Reactive Al_2O_3 :	9% by weight

Al₂O₃ content 99%,
BET surface < 6 m²/g,
d₅₀ 4-8 microns

SiO₂ sand (0.1 - 0.5 mm grain size) 40.5% by weight

Water glass (43 - 45% solution) 11% by weight

The components were thoroughly mixed, and a feeder mold was filled with the resulting mass. The feeder mold was gassed with carbon dioxide. The water glass reacted with the carbon dioxide resulting in the formation of colloidal silicic acid and sodium carbonate which hardened the feeder mass. Then the mass was dried until the weight is constant.

The feeder was placed on the casting model and thus rammed up, whereupon molten iron was poured into the mold. In doing so the feeder mass ignited as the temperature rises, the sodium carbonate obtained from the water glass and the reaction product of the sodium nitrate preferably reacted with the reactive Al₂O₃ so that the hollow fire which occurred during the reaction with sand was reduced. After the end of the casting process the feeder was removed. After the reaction the feeder showed in cross section a host of small cavities which were not interconnected by channels and thus which did not contain any iron either (Figure 1).

Example 2

Formulation:

Aluminum (as in example 1) 20% by weight

Sodium nitrate (as in example 1) 10% by weight

Magnesium (as in example 1) 4% by weight

Reactive Al_2O_3 (as in example 1)	12.5% by weight
SiO_2 hollow microspheres (0 - 0.5 mm grain size) bulk weight $350 \text{ cm}^3/\text{g}$, SiO_2 content 55-65%)	36.5% by weight
Water glass (as in example 1)	17% by weight

The components were mixed with one another as in example 1, placed in a feeder mold, gassed with carbon dioxide, and dried. Casting was also carried out as in example 1. The cross section of the reacted feeder mass showed essentially the same pore structure as the feeder from example 1.

Example 3 (comparison)

The formulation was the same as in example 1, but instead of reactive Al_2O_3 , 9% by weight Al_2O_3 with the following properties were used: Al_2O_3 content 99%, grain size 0 to 0.5 mm ($d_{50} = 200$ microns).

Processing continued as in example 1. The resulting feeder (see Figure 2 for an extract from the feeder wall) after the reaction showed a major hollow fire with a large cavity volume in the center which was connected via channels to smaller cavities which extended into the region of the molten iron. All the cavities were filled with solidified iron. When the feeder was crushed, residues of the reacted feeder mass adhered to the pieces of iron. The compressive strength of the conventionally produced cylindrical test piece ($d = 50 \text{ mm}$, $h = 50 \text{ mm}$) for quality control of the feeder mass from Example 3 was about 35% less than that of the test piece from Example 1.

Claims

11. An exothermal feeder mass comprising aluminum, magnesium, at least one oxidizing agent, a SiO_2 -containing filler, an alkali silicate as a binder and about 2.5 to about 20 percent by weight of a reactive aluminum oxide with a specific surface area of at least about $0.5 \text{ m}^2/\text{g}$ and an average particle diameter (d_{50}) from about 0.5 to about 8 microns, and wherein the mass is essentially free of fluoride.
12. The feeder mass of Claim 11 wherein the reactive aluminum oxide has a specific surface area of about 1 to about $10 \text{ m}^2/\text{g}$.
13. An essentially fluoride free exothermal feeder mass comprising about 20 to about 35 percent by weight aluminum, about 1.5 to about 10 percent by weight magnesium, about 8 to about 20 percent by weight of an oxidizing agent, about 4 to about 18 percent by weight of a reactive aluminum oxide, about 8 to about 22 percent by weight of an alkali silicate and about 58.5 to about 17 percent by weight of a temperature resistant SiO_2 -containing filler.
14. The feeder mass of Claim 13 wherein the aluminum comprises from about 22 to about 28 percent by weight.
15. The feeder mass of Claim 13 wherein the magnesium comprises from about 2 to about 7 percent by weight.
16. The feeder mass of Claim 13 wherein the oxidizing agent comprises about 10 to about 15 percent by weight.
17. The feeder mass of Claim 13 wherein the reactive aluminum oxide comprises about 8 to about 13 percent by weight.
18. The feeder mass of Claim 13 wherein the alkali silicate comprises from about 10

to about 13 percent by weight.

19. The feeder mass of Claim 13 wherein the alkali silicate comprises from about 17 to about 22 percent by weight.

20. The feeder mass of Claim 13 wherein the temperature-resistant SiO_2 -containing filler comprises from about 43 to about 29 percent by weight.

21. The feeder mass of Claim 11 wherein the oxidizing agent comprises iron oxide.

22. The feeder mass of Claim 13 wherein the oxidizing agent comprises iron oxide.

23. The feeder mass of Claim 11 wherein the oxidizing agent comprises an alkali nitrate.

24. The feeder mass of Claim 13 wherein the oxidizing agent comprises an alkali nitrate.

25. The feeder mass of Claim 11 wherein the SiO_2 -containing filler has a SiO_2 content of at least about 50 percent by weight.

26. The feeder mass of Claim 13 wherein the temperature resistant SiO_2 -containing filler has a SiO_2 content of at least about 50 percent by weight.

27. The feeder mass of Claim 11 wherein the SiO_2 -containing filler has a SiO_2 content of at least about 60 percent by weight.

28. The feeder mass of Claim 13 wherein the temperature resistant SiO_2 -containing filler has a SiO_2 content of at least about 60 percent by weight.

29. The feeder mass of Claim 11 wherein the SiO_2 -containing filler is comprised of a material selected from the group consisting of quartz, sand, aluminum silicates and combinations thereof.

30. The feeder mass of Claim 13 wherein the temperature resistant SiO_2 -containing filler is comprised of a material selected from the group consisting of quartz, sand, aluminum silicates and combinations thereof.

31. The feeder mass of Claim 13 wherein the temperature resistant SiO_2 -containing filler is formed in a shape selected from the group consisting of hollow microspheres, ground chamotte, mineral fibers and combinations thereof.

32. The feeder mass of Claim 11 wherein the properties of the reactive aluminum oxide comprise the following:

- an Al_2O_3 content greater than about 90 percent by weight,
- a content of OH-groups up to about 5 percent,
- a specific surface area (BET) from about 1 to about $10 \text{ m}^2/\text{g}$, and
- an average particle diameter (d_{50}) from about 0.5 to about 15 microns.

33. The feeder mass of Claim 13 wherein the properties of the reactive aluminum oxide comprise the following:

- an Al_2O_3 content greater than about 90 percent by weight,
- a content of OH-groups up to about 5 percent,
- a specific surface area (BET) from about 1 to about $10 \text{ m}^2/\text{g}$, and
- an average particle diameter (d_{50}) from about 0.5 to about 15 microns.

34. A process for reducing hollow fire in an essentially fluoride-free feeder mass comprising preparing the feeder mass utilizing the compositions of Claim 11.

35. A process for reducing hollow fire in an essentially fluoride-free feeder mass comprising preparing the feeder mass utilizing the compositions of Claim 13.

36. A process for preventing graphite degeneration in a feeder neck area of a feeder mass and in an area which extends into the casting of a feeder mass comprising casting the feeder mass composition of Claim 11.

37. A process for preventing graphite degeneration in a feeder neck area of a feeder mass and in an area which extends into the casting of a feeder mass comprising casting the feeder mass composition of Claim 13.

Abstract

An exothermal feeder mass is described, containing aluminum and magnesium, at least one oxidizing agent, a SiO_2 -containing filler, and an alkali silicate as the binder. It is characterized in that it contains about 2.5 to 20% by weight of a reactive aluminum oxide with a specific surface of at least about $0.5 \text{ m}^2/\text{g}$, an average particle diameter (d_{50}) from about 0.5 to 8 microns and is essentially free of fluoride-containing fluxes.

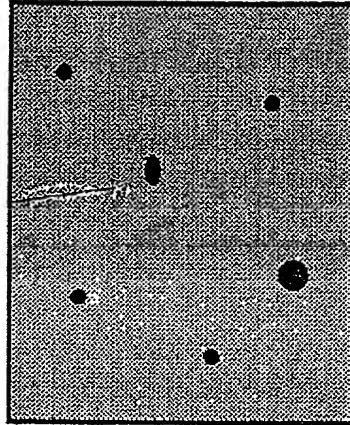


Fig. 1

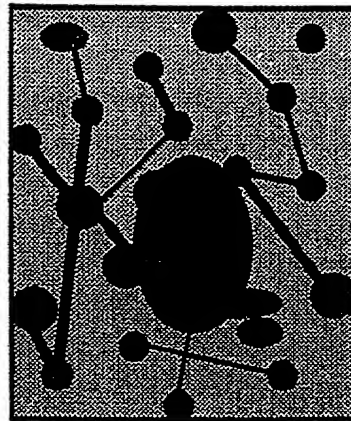


Fig. 2

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(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES
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Zur Erklärung der Zweibuchstaben-Codes, und der anderen
Abkürzungen wird auf die Erklärungen ("Guidance Notes on
Codes and Abbreviations") am Anfang jeder regulären Ausgabe
der PCT-Gazette verwiesen.

(72) Erfinder; und

(75) Erfinder/Anmelder (nur für US): SKERDI, Udo

(54) Title: EXOTHERMIC FEEDER

(54) Bezeichnung: EXOTHERME SPEISERMASSE

(57) Abstract: The invention relates to an exothermic feeder, containing aluminum and magnesium, at least one oxidizing agent, a feeder containing SiO₂ and an alkali silicate that serves as a binder. The inventive feeder is characterized in that it contains approximately 2.5 to 20 wt. % of a reactive aluminum oxide with a specific surface of at least approximately 0.5 m²/g and an average particle diameter (d₅₀) of approximately 0.5 to 8 µm and in that it is practically free of fluoride-containing flux agents.

(57) Zusammenfassung: Beschrieben wird eine exotherme Speisermasse, enthaltend Aluminium und Magnesium, mindestens ein Oxidationsmittel, einen SiO₂-haltigen Füllstoff und ein Alkalisilicat als Bindemittel; sie ist dadurch gekennzeichnet, daß sie etwa 2,5 bis 20 Gew.-% eines reaktiven Aluminiumoxids mit einer spezifischen Oberfläche von mindestens etwa 0,5 m²/g und einem mittleren Teilchendurchmesser (d₅₀) von etwa 0,5 bis 8 µm enthält und praktisch frei von fluoridhaltigen Flußmitteln ist.

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TRANSLATION FROM GERMAN

Patent ApplicationExothermal feeder massSpecification

The invention relates to an exothermal feeder mass containing aluminum and magnesium, at least one oxidizing agent, a temperature-resistant SiO_2 -containing filler, and an alkali silicate as the binder.

In exothermal feeder masses the aluminum is used to cause an exothermal reaction with the oxidizing agent, known feeder masses also containing a reactive fluorine compound which reacts with a passivating oxide skin on the aluminum powder so that the latter can react with the oxidizing agents.

One such feeder mass is described for example in DE-C-25 32 745. It contains among others aluminum powder, an unspecified aluminum oxide and an organic (phenol resin, urea resin or furan resin, starch) or an inorganic binder (silica sol, colloidal aluminum oxide) and an oxidizing agent for the fine-particle metal. The use of alkali silicates as binders is not mentioned. The fluorine compounds, called "fluoride catalysts", such as cryolite, fluorspar or sodium silicofluoride are important. The proportion of the fluorine compound can be 0.1 to 20% by weight; according to the examples the proportion of the fluoride compound is between 1.0 and 2.0%.

The presence of the fluorine compound in the exothermal feeder mass reduces the starting reaction temperature of the aluminum. This function results for example from the fact that for the likewise described heat-insulating feeder mass without aluminum the proportion of the fluoride compound can decrease to 0%.

DE-A-29 23 393 mentions among others exothermal feeder masses with aluminum power, cryolite, iron oxide, sand and aluminum oxide fibers. The latter should be preserved as fibers.

DE-C-28 31 505 describes an exothermal feeder mass with an Al_2O_3 additive which however can be construed as an inert filler. Alkali silicates are not used, but the addition of a

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fluoride-containing flux (cryolite) is always necessary. Magnesium is not used.

DD-60 121 describes an exothermal feeder mass based on aluminum with the addition of water glass and a fluoride-containing flux. Aluminum oxide is not mentioned.

Since for environmental and process-engineering reasons there is a need for a fluoride-free exothermal feeder mass, it has already been suggested that an exothermal feeder mass without active fluorine portions be made available. One such feeder mass contains not only aluminum, but also magnesium or an aluminum-magnesium alloy. The passivity caused by the oxide skin on the aluminum is overcome by the temperature which occurs when the magnesium burns so that the aluminum also reacts with the oxidizing agent, by which a higher temperature is reached overall. In doing so, unwanted reactions occur in the feeder mass.

It was found that for fluoride-free exothermal feeder masses which contain aluminum and magnesium and also fillers with high SiO_2 content and alkali compounds (for example, from water glass) as the binder and alkali nitrates as the oxidizing agent, a so-called "hollow fire" is formed which probably originates from vitrification of the SiO_2 -containing fillers with the alkali compounds.

The hollow fire is expressed in large cavities in the feeder wall which is connected by channels to the molten iron in the feeder. Iron losses occur due to penetration of the molten iron into the cavity. Moreover, this iron can only be separated from the reacted feeder mass with difficulty, so that it is almost impossible to re-generate the iron.

The object of this invention is to reduce the so-called "hollow fire".

It was found that surprisingly a hollow fire does not occur when a reactive or extremely finely ground aluminum oxide is added to the feeder mass.

The subject matter of the invention is thus an exothermal feeder mass of the initially mentioned type which contains roughly 2.5 to 20% by weight of a reactive aluminum oxide with a specific surface of at least roughly $0.5 \text{ m}^2/\text{g}$ and an average particle diameter (d_{50}) from roughly 0.5 to 15 microns and which is essentially free of fluoride-containing fluxes.

The reactive aluminum oxide generally contains up to roughly 5% OH groups. When the proportion of OH groups is relatively low, reactivity is also achieved by the very small size of the aluminum oxide particles.

"Essentially free" is defined as the fluoride content being below 1.0, preferably below 0.5, especially below 0.1% by weight.

The exothermal feeder mass as claimed in the invention after reaction shows only small cavities which are not connected to one another by channels so that no iron from the feeder core can penetrate.

The action of the reactive aluminum oxide can be imagined such that it reacts with the

existing alkali compounds so that they can no longer react with the SiO_2 -containing filler with vitrification and cavity formation. When a hollow fire no longer occurs, during and after the end of the reaction of the feeder mass its strength also increases.

The reactive aluminum oxide in the feeder mass as claimed in the invention preferably has a specific surface of roughly 1 to $10 \text{ m}^2/\text{g}$. Generally the composition of the feeder mass as claimed in the invention is as follows:

Aluminum: 20 - 35% by weight, preferably 20 - 23% by weight

Magnesium: 1.5 - 10% by weight, preferably 2 - 7% by weight

Oxidizing agent: 8 - 20% by weight, preferably 10 - 15% by weight

Reactive aluminum oxide: 4 - 18% by weight, preferably 8 - 13% by weight

Alkali silicate: 8 - 22% by weight, preferably 10 - 13% by weight or 17 - 23% by weight

SiO_2 -containing filler: 58.5 - 17% by weight, preferably 43 - 29% by weight

The preferred amounts of the alkali silicate depend on the filler. For fillers with a smaller bulk density (for example, hollow microspheres) the preferred amount of the alkali silicate is higher.

The oxidizing agent, as in the known feeder masses, is iron oxide and/or an alkali nitrate, such as sodium or potassium nitrate, the reduction product of the latter (alkali nitrite or alkali oxide) reacting with the reactive aluminum oxide.

Preferably the SiO_2 -containing filler has a SiO_2 content of at least 50% by weight, especially of more than 60% by weight.

The temperature-resistant SiO_2 -containing fillers can be quartz sand and/or aluminum silicates, in the latter case preferably hollow microspheres, ground chamotte and/or mineral fibers being used.

The reactive aluminum oxide preferably has the following properties:

Al ₂ O ₃ content	> 90%
Content of OH-groups:	up to 5% (depending on the particle diameter)
Specific surface (BET)	roughly 1 to 10 m ² /g
Average particle diameter (d ₅₀):	0.5 to 15 microns

The subject matter of the invention is also a process for reducing the hollow fire in essentially fluoride-free feeder masses; the process is characterized by a feeder mass as defined above being used.

It was furthermore found that when using the feeder mass as claimed in the invention a change of the molten iron contained in the feeder, which change extends into the casting, surprisingly occurs. The basic metallic structure is changed such that degeneration of the solidified casting mass is prevented by the formation of flaky graphite and the desired spheroidal graphite is formed. This can possibly be attributed to the presence of magnesium in the feeder mass as a spherogenic additive, although it does not come directly into contact with the molten iron and therefore no interaction between the two could be expected. A reaction of the magnesium contained in the feeder mass with the molten iron in the vapor phase can be considered precluded, since magnesium has an extremely low vapor pressure and the feeder mass contains air inclusions between the grains of fine-grain mineral, so that the vaporous magnesium would immediately react with atmospheric oxygen. The effect which can be achieved by the invention is probably due to the fact that the feeder mass contains impurities (for example, sulfur) which can diffuse without the magnesium in the feeder mass into the molten iron and in this way can react with the very small amounts of the spherogenic additive (for example, magnesium) in the molten iron, so that when the iron solidifies, not spheroidal graphite, but flaky graphite, forms. It is assumed that the magnesium in the feeder mass reacts with the impurities contained therein so that they can no longer diffuse into the molten iron. The magnesium therefore apparently has a "scavenger" function.

In addition to the magnesium, also other spherogenic additives, such as cerium, can be used. Alkali metals or alkaline earth metals other than magnesium, for example, calcium, are not as well suited since they easily oxidize in air.

The subject matter of the invention is thus a process for preventing graphite degeneration in the feeder neck area and in the area which extends into the casting; this process is characterized by a feeder mass as defined above being used.

The invention is explained by the following examples.

Example 1

Formulation:

Aluminum (0.063 - 0.5 mm grain size)	20% by weight
Sodium nitrate as oxidizing agent:	15% by weight
Magnesium (0.1 - 0.5 mm grain size)	4.5% by weight
Reactive Al ₂ O ₃ : Al ₂ O ₃ content 99%, BET surface < 6 m ² /g, d ₅₀ 4-8 microns	9% by weight
SiO ₂ sand (0.1 - 0.5 mm grain size)	40.5% by weight
Water glass (43 - 45% solution)	11% by weight

The components are thoroughly mixed, and a feeder mold is filled with the resulting mass. The feeder mold is gassed with carbon dioxide; the water glass reacts with the carbon dioxide with the formation of colloidal silicic acid and sodium carbonate and hardens the feeder. Then the mass is dried until the weight is constant.

The feeder is placed on the casting pattern and thus rammed up, whereupon molten iron is poured into the mold. In doing so the feeder mass ignites as the temperature rises, the sodium carbonate obtained from the water glass and the reaction product of the sodium nitrate preferably reacting with the reactive Al₂O₃ so that the hollow fire which occurs during the reaction with sand is reduced. After the end of the casting process the feeder is removed. After the reaction the feeder shows in cross section a host of small cavities which are not interconnected by channels and thus which do not contain any iron either (Figure 1).

Example 2

Formulation:

Aluminum (as in example 1)	20% by weight
Sodium nitrate (as in example 1)	10% by weight
Magnesium (as in example 1)	4% by weight
Reactive Al ₂ O ₃ (as in example 1)	12.5% by weight
SiO ₂ hollow microspheres (0 - 0.5 mm grain size) bulk weight 350 cm ³ /g, SiO ₂ content 55-65%)	36.5% by weight

Water glass (as in example 1)

17% by weight

The components are mixed with one another as in example 1, placed in a feeder mold, gassed with carbon dioxide, and dried. Casting is also carried out as in example 1. The cross section of the reacted feeder mass shows essentially the same pore structure as the feeder from example 1.

Example 3 (comparison)

The formulation was the same as in example 1, but instead of reactive Al_2O_3 , 9% by weight Al_2O_3 with the following properties were used: Al_2O_3 content 99%, grain size 0 to 0.5 mm ($d_{50} = 200$ microns).

Processing continued as in example 1. The resulting feeder (see Figure 2 for an extract from the feeder wall) after the reaction shows a major hollow fire with a large cavity volume in the center which is connected via channels to smaller cavities which extend into the region of the molten iron. All the cavities are filled with solidified iron. When the feeder is crushed, residues of the reacted feeder mass adhere to the pieces of iron. The compressive strength of the conventionally produced cylindrical test piece ($d = 50$ mm, $h = 50$ mm) for quality control of the feeder mass from Example 3 is roughly 35% less than that of the test piece from Example 1.

Claims

1. Exothermal feeder mass, containing aluminum and magnesium, at least one oxidizing agent, a SiO₂-containing filler, and an alkali silicate as the binder, characterized in that it contains roughly 2.5 to 20% by weight of a reactive aluminum oxide with a specific surface of at least roughly 0.5 m²/g and an average particle diameter (d₅₀) from roughly 0.5 to 8 microns and that it is essentially free of fluoride-containing fluxes.
2. Feeder mass as claimed in claim 1, wherein the reactive aluminum oxide has a specific surface of roughly 1 to 10 m²/g.
3. Feeder mass as claimed in claim 1 or 2, characterized by the following composition:
 - aluminum: 20 - 35% by weight, preferably 22 - 28% by weight
 - magnesium: 1.5 - 10% by weight, preferably 2 - 7% by weight
 - oxidizing agent 8 - 20% by weight, preferably 10 - 15% by weight
 - reactive aluminum oxide 4 - 18% by weight, preferably 8 - 13% by weight
 - alkali silicate: 8 - 22% by weight, preferably 10 - 13% by weight or 17 - 22% by weight
 - temperature-resistant SiO₂-containing filler: 58.5 - 17% by weight, preferably 43 - 29% by weight
4. Feeder mass as claimed in one of claims 1 to 3, wherein the oxidizing agent is iron oxide or an alkali nitrate.
5. Feeder mass as claimed in one of claims 1 to 4, wherein the temperature-resistant SiO₂-containing filler has a SiO₂ content of at least 50% by weight, especially of more than 60% by weight.
6. Feeder mass as claimed in one of claims 1 to 5, wherein the temperature-resistant SiO₂-containing fillers are quartz sand and/or aluminum silicates.
7. Feeder mass as claimed in claim 6, wherein the temperature-resistant SiO₂-containing fillers are hollow microspheres, ground chamotte and/or mineral fibers.
8. Feeder mass as claimed in one of claims 1 to 6, wherein the reactive aluminum oxide has the following properties:

Al₂O₃ content > 90%

Content of OH-groups: up to 5%
Specific surface (BET): 1 to 10 m²/g

Average particle diameter (d₅₀): 0.5 to 15 microns

9. Process for reducing the hollow fire in essentially fluoride-free feeder masses, wherein a feeder mass as claimed in one of claims 1 to 8 is used.

10. Process for preventing graphite degenerations in the feeder neck area and in the area which extends into the casting, wherein a feeder mass as claimed in one of claims 1 to 8 is used.

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY
(Includes Reference to PCT International Applications)

ATTORNEY'S DOCKET NUMBER

P-1105

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

EXOTHERMAL FEEDER MASS

the specification of which (check only one item below):

☐ is attached hereto.☒ was filed as United States applicationSerial No. 10/009/537on November 30, 2001

and was amended

on _____ (if applicable).

☒ was filed as PCT international applicationNumber PCT/EP 00/04597on 20 May 2000

and was amended under PCT Article 19

on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY (If PCT indicate PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
Germany	199 25167.3	01 June 1999	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
PCT	WO 00 73236	20 May 2000	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
PCT/EP	PCT/EP 00 04597		<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO

Combined Declaration For Patent Application and Power of Attorney (Continued)			ATTORNEY'S DOCKET NUMBER P-1105		
<p>I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:</p>					
PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120.					
U.S. APPLICATIONS			STATUS (Check one)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED	
PCT APPLICATIONS DESIGNATING THE U.S.					
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)			
PCT/EP 00 04597	20 May 2000				
<p>POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (List name and registration number)</p> <p style="text-align: center;">Scott R. Cox Reg. No. <u>31,945</u></p>					
<p>Send Correspondence to: <u>Scott R. Cox</u> <u>LYNCH, COX, GILMAN & MAHAN, P.S.C.</u> <u>400 West Market St., Suite 2200</u> <u>Louisville, KY 40202</u></p>				<p>Direct Telephone Calls to (name and telephone number) <u>Scott R. Cox</u> <u>(502) 589-4215</u></p>	
201	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP	
	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY	GERMANY	
202	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP	
	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY		
203	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP	
	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY		
<p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon</p>					
SIGNATURE OF INVENTOR 201		SIGNATURE OF INVENTOR 202		SIGNATURE OF INVENTOR 203	
DATE		DATE		DATE	
14.11.2001					